

NPDES
Best Management Practices
GUIDANCE DOCUMENT

Environmental Protection Agency
Office of Water Enforcement and Permits
NPDES Technical Support Branch

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PREFACE

During the period June 13, 1978, to February 26, 1979, Hydrosience, Inc., under Contract No. 68-03-2568 to the Environmental Protection Agency (EPA), gathered information leading to the identification of best management practices (BMPs) currently used by industry. The result of the data gathering and analysis by Hydrosience, Inc., was a draft report entitled "NPDES Best Management Practices Guidance Document" EPA 600/9-79-045. In response to keen public interest in the draft report, EPA made the report available to the public and provided a 45-day comment period. The comment period subsequently was extended twice, resulting in a total 120-day comment period on the report. After evaluating the comments received, EPA revised the draft report, and published this final document. This document supersedes the Hydrosience draft report dated December 1979.

ABSTRACT

The purpose of this document is to assist National Pollutant Discharge Elimination System (NPDES) permitting authorities, compliance officers and permit applicants to develop Best Management Practices (BMP) plans for industry. BMPs are authorized under the 1977 Clean Water Act for the control of discharges to receiving waters of significant amounts of any pollutant listed as hazardous under Section 311 of the Act or toxic under Section 307 of the Act from activities which are associated with or ancillary to industrial manufacturing or treatment processes. The general types of discharges to be controlled by BMPs are plant site runoff, spillage and leaks, sludge and waste disposal, and drainage from material storage areas.

This document provides a basis for developing BMP plans. The proper use of the document requires engineering experience with industrial manufacturing and treatment processes and knowledge of current laws and regulations applicable to NPDES permits, BMP plans, and Spill, Prevention, Control and Countermeasure (SPCC) plans.

The guidance herein is based on a review by Hydrosience, Inc. (EPA Contract No. 68-03-2568) of current practices used by industry to control the non-routine discharge of toxic pollutants and hazardous substances. Included in the review are published articles and reports, technical bulletins (also termed material safety data sheets) on specific compounds, and discussions with industry through telephone contacts, written questionnaires, and site visits.

SECTION I

INTRODUCTION

Background

The Federal Water Pollution Control Act Amendments of 1972 established the objective of restoring and maintaining the chemical, physical, and biological integrity of the Nation's water. This objective has remained unchanged in the 1977 amendments to the Act, commonly referred to as the Clean Water Act of 1977, hereinafter "the Act". To achieve this end, the Act sets forth a series of goals, including the goal of eliminating the discharge of pollutants into navigable waters by 1985. The principal mechanism for reducing the discharge of pollutants from point sources is through implementation of the National Pollutant Discharge Elimination System (NPDES) established by Section 402 of the Act.

At the time of first round NPDES permit issuance, conventional pollutants (BOD, pH, TSS, etc.) were considered the parameters which most urgently needed controls. In second round permitting, however, the Agency emphasis is shifting from the conventional pollutants to the control of toxic pollutants and hazardous substances.

Traditionally, NPDES permits have contained chemical-specific numerical effluent limits. Effluent guidelines are not always available to prescribe these effluent limits nor to guarantee water quality sufficient for the protection of indigenous aquatic life. To improve water quality, the Act provides for water pollution controls supplemental to effluent limitations guidelines. Best Management Practices (BMPs) are one such supplemental control.

Pursuant to Sections 304 and 402 of the Act, BMPs may be incorporated as permit conditions. In the context of the NPDES program, BMPs are actions or procedures to prevent or minimize the potential for the release of toxic pollutants or hazardous substances in significant amounts to surface waters. BMPs, although normally qualitative, are expected to be most effective when used in conjunction with numerical effluent limits in NPDES permits.

Statutory Authority

Section 304(e) of the Act authorized the Administrator to publish regulations to control discharges of significant amounts of toxic pollutants listed under Section 307 or hazardous substances listed under Section 311 from activities which the Administrator determines are associated with or ancillary to industrial manufacturing or treatment processes. The discharges to be controlled by BMPs are plant site runoff, spillage or leaks, sludge or waste disposal and drainage from raw material storage.

Section 402(a)(1) of the Act allows the Administrator to prescribe conditions in a permit determined necessary to carry out the provisions of the Act. BMPs are one such condition.

BMPs are intended to complement other regulatory requirements imposed by RCRA, OSHA, the Clean Air Act, and SPCC plans for hazardous substances under the Clean Water Act. Pursuant to Section 311 of the Act, EPA has proposed (40 CFR Part 151) requirements for SPCC plans to prevent discharges of hazardous substances from facilities subject to NPDES permitting requirements.

The guidelines proposed for hazardous substances SPCC plans are very similar to those required for oil SPCC plans in the Oil Pollution Prevention Regulations, (40 CFR Part 112). Since the Agency has received favorable comments about the Oil Pollution Prevention Regulations, the NPDES BMP regulation has been structured to be similar to the oil SPCC regulation.

BMP Regulatory History

On September 1, 1978, EPA proposed regulations (43 FR 39282) addressing the use of procedures to control discharges from activities associated with or ancillary to industrial manufacturing or treatment processes. The proposed rule indicated how best management practices would be imposed in NPDES permits to prevent the release of toxic and hazardous pollutants to surface waters. The proposed regulation was incorporated as "40 CFR Part 125, Subpart L - Criteria and Standards for Best Management Practices Authorized Under section 304(e) of the Act" in the August 21, 1978 proposed NPDES regulations (43 FR 37078). A 60-day comment period on proposed Subpart L was provided.

After evaluating the comments received on the proposed regulation, EPA revised Subpart L and promulgated the regulation as Subpart K (44 FR 32954-5) on June 7, 1979. Industries regulated by Subpart K were to develop a BMP program and submit the program with their permit application. Subpart K stated that information on the development of BMP programs was contained in a publication entitled "NPDES Best Management Practices Guidance Document." Subpart K was to become effective on August 13, 1979. However, publication of the report was delayed beyond August 13, 1979.

Therefore, on August 10, 1979, EPA deferred applicability of the BMP portions of the NPDES regulations until 60 days after publication in the Federal Register of a notice of availability of the final document (44 FR 47063). EPA announced on March 20, 1980 the availability of the draft report and provided a 45-day comment period (45 FR 17997), which subsequently was extended twice, resulting in a 120-day comment period on the report. Based on public comments on the draft report and further discussion with industry, the Agency revised the draft report and published this guidance document.

Final BMP Regulation

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SECTION II

USE OF THE GUIDANCE DOCUMENT

This document should be used for guidance in developing BMP plans. The document is not intended to specify site-specific or pollutant-specific BMPs. As its name suggests, the NPDES Best Management Practices Guidance Document is to be considered guidance by NPDES permitting authorities, compliance officers, permit applicants and permittees and should be used in a flexible manner in the formulation of BMP plans. Consequently, the document identifies elements of each specific requirement that should be considered in the development of the BMP plan, but does not require that each element be included in every facility's BMP plan.

In utilizing this document to develop a BMP plan, the applicant/permittee is encouraged to use the most cost-effective and innovative techniques to fit the particular facility or circumstances. The format and content of a BMP plan may vary from site to site and industry to industry, depending upon the specific situation. In addition, an applicant/permittee may add, delete, or modify the elements of the specific requirements presented in the document where equivalent results can be attained.

If an applicant/permittee needs assistance to develop a BMP plan, he/she may contact the appropriate permit issuing authority for advice. The permitting authority, as necessary, may seek assistance from the Technical Program Development Section of the NPDES Technical Support Branch in Washington, D.C.

SECTION III

BMP PLANS

Scope

The activities which are associated with or ancillary to the industrial manufacturing or treatment process are subject to BMPs. For brevity, all such activities are referred to as "ancillary sources". The ancillary sources at the plant should be examined to determine if there is a reasonable potential for equipment failure (e.g., spillage or leakage), natural conditions (e.g., plant site runoff or drainage from raw material storage), or other circumstances (e.g., sludge or waste disposal) which should result in the discharge of a significant amount of toxic pollutants or hazardous substances to receiving waters. The ancillary sources are divided for discussion in this document into five (5) categories: material storage areas; loading and unloading areas; plant site runoff; in-plant transfer, process, and material handling areas; and sludge and hazardous waste disposal areas.

Material storage areas include storage areas for toxic and hazardous chemicals as raw materials, intermediates, final products or by-products. Included are: liquid storage vessels that range in size from large tanks to 55-gallon drums; dry storage in bags, piles, bins, silos, and boxes; and gas storage in tanks and vessels.

Loading and unloading operations involve the transfer of materials to and from trucks or railcars but not in-plant transfers. These operations include pumping of liquids or gases from truck or railcar to

a storage facility or vice versa, pneumatic transfer of dry chemicals to or from the loading or unloading vehicle, transfer by mechanical conveyor systems, and transfer of bags, boxes, drums, or other containers from vehicles by fork-lift trucks or other materials handling equipment.

Plant runoff is generated principally from rainfall on a plant site. Runoff from material storage areas, in-plant transfer areas, loading and unloading areas, and sludge disposal sites potentially could become contaminated with toxic pollutants and hazardous substances. Heavy metals from sludge disposal sites are of special concern. Fallout, resulting from the plant air emissions which settle on the plant site, may also contribute to contaminated runoff. Contaminated runoff may reach a receiving body of water through overland flow, drainage ditches, storm or noncontact cooling water sewers, or overflows from combined sewer systems.

In-plant transfer areas, process areas, and material handling areas encompass all in-plant transfer operations from raw material to final product. Various operations could include: transfer of liquids or gases by pipelines with appurtenances such as pumps, valves and fittings; movement of bulk materials by mechanical conveyor-belt systems; and fork-lift truck transport of bags, drums, and bins. All transfer operations within the process area with a potential for release of toxic pollutants and hazardous substances to other than the process waste water system are addressed in this grouping.

Sludge and hazardous waste disposal areas are potential sources of contamination of receiving waters. These operations include land-fills, pits, ponds, lagoons, and deep-well injection sites.

Depending on the construction and operation of these sites there may be a potential for leachate containing toxic pollutants or hazardous substances to seep into the ground water, eventually reaching surface waters, or for liquids to overflow to surface waters from these disposal operations. BMP requirements are not intended to duplicate the requirements of RCRA. Actions taken for compliance with RCRA may be referenced in the BMP plan.

Minimum Requirements

BMPs may include some of the same practices used by industry for pollution control, SPCC plans for oil and hazardous substances, safety programs, fire protection, protection against loss of valuable raw materials or products, insurance policy requirements or public relations. The minimum requirements of a BMP plan are listed in Table 1 and are divided into two (2) categories: general requirements and specific requirements.

TABLE 1

Minimum Requirements of a BMP Plan

- A. General Requirements
 - 1. Name and location of facility
 - 2. Statement of BMP policy and objectives
 - 3. Review by plant manager
- B. Specific Requirements
 - 1. BMP Committee
 - 2. Risk Identification and Assessment
 - 3. Reporting of BMP Incidents
 - 4. Materials Compatibility
 - 5. Good Housekeeping
 - 6. Preventive Maintenance
 - 7. Inspections and Records
 - 8. Security
 - 9. Employee Training

General Requirements

The BMP plan should be organized and described in an orderly narrative format and should be reviewed by the plant engineering staff and plant manager. A description of the facility, including the plant name, the type of plant, processes used, and the products manufactured should be included in the BMP plan. A map showing the location of the facility and the adjacent receiving waters also should be part of the plan. Specific objectives for the control of toxic pollutants and hazardous substances should be included in the statement of corporate policy.

Specific Requirements

Each of the nine (9) specific requirements listed in Table 1 should be addressed in the BMP plan. The size and complexity of the BMP plan will vary with the corporate environmental policy, size, complexity, and location of the facility, among other factors. It is anticipated that the length and detail of the BMP plan will be commensurate with the quantity of toxic and hazardous chemicals onsite and their opportunity for discharge. A fundamental concept of the BMP plan is determining the potential for toxic and hazardous chemicals to reach receiving waters and taking appropriate preventive measures.

Discussions of the specific requirements are presented on the following pages. Each specific requirement contains important elements that should be considered in developing a BMP plan. All elements may not be applicable to all facilities. Elements should be added, deleted or modified to fit the needs of a particular facility. Permittees are encouraged to use innovative techniques to achieve equivalent results.

1. BMP Committee

The BMP Committee is that group of individuals within the plant organization which is responsible for developing the BMP plan and assisting the plant management in its implementations, maintenance and updating. Thus, the Committee's functions are similar to those of a plant fire prevention or safety committee.

The scope of activities and responsibilities of the "BMP Committee" should include all aspects of the facility's BMP plan, such as identification of toxic and hazardous materials handled in the plant; identification of potential spill sources; establishment of incident reporting procedures; development of BMP inspection and records procedures; review of environmental incidents to determine and implement necessary changes to the BMP plan; coordination of plant incident response, cleanup and notification of authorities; establishment of BMP training for plant personnel; and aiding interdepartmental coordination in carrying out the BMP plan.

Other Committee duties could include review of new construction and changes in processes and procedures at the facility relative to spill prevention and control. The Committee can also periodically evaluate the effectiveness of the overall BMP plan and make recommendations to management on BMP-related matters.

Plant management has overall responsibility for the BMP plan. The plan should contain a clear statement of the management's policies and responsibilities related to BMPs. Authority and responsibility for immediate action in the event of a spill should be clearly established and documented in the BMP plan, with the Committee indirectly involved in that responsibility.

The Committee should advise management on the technical aspects of environmental incident control, but should not impede the decision-making process for preventing or mitigating spills and incidents.

The size and composition of the BMP Committee should be appropriate to the size and complexity of the plant and the specific toxic and hazardous chemicals handled at the plant. Facility personnel knowledgeable in spill control and waste treatment such as environmental specialists, production foreman, safety and health specialists, and treatment plant supervisor should be included. In some small plants, the Committee might consist of the one manager or engineer assigned responsibility for environmental control. For very small facilities, the Committee function might even have to be fulfilled by competent engineers or managers from the corporate staff or the nearest large plant.

A list of personnel on the BMP Committee should be included in the BMP plan. The list should have the office and home telephone numbers of the Committee members and the names and phone numbers of backup or alternate people.

Elements of the "BMP Committee", listed below, should be considered in developing a BMP plan:

- Inclusion of facility personnel knowledgeable in spill control, safety and health, and waste treatment such as environmental specialists, production foreman, occupational safety and health specialists, and treatment plant supervisor.
- Responsibility for
 - providing assistance to plant management for developing a BMP plan,

- providing assistance to plant management in implementing, maintaining, and updating the BMP plan,
- identifying toxic and hazardous substances,
- identifying potential spill sources,
- establishing BMP incident reporting procedures,
- developing BMP inspections and records procedures,
- reviewing environmental incidents,
- coordinating plant incident response, cleanup and notification procedures,
- establishing BMP training for plant and contractor personnel,
- providing assistance for interdepartmental coordination in carrying out the BMP plan,
- reviewing new construction and changes in processes and procedures,
- evaluating the effectiveness of the BMP plan,
- making recommendations to management in support of corporate policy on BMP-related matters.

2. Risk Identification and Assessment

The areas of the plant subject to BMP requirements should be identified by the BMP Committee, plant engineering group, environmental engineer, or others in the plant. Each such area should be examined for the potential risks for discharges to receiving waters of toxic pollutants or hazardous substances from ancillary sources. Any existing physical means (dikes, diversion ditches, etc.) of controlling such discharges also should be identified.

The areas described above should be clearly indicated on a plant plot plan or drawing. A simplified materials flowsheet showing major process operations can be used to indicate the direction and quantity of materials flowing from one area to another. The direction of flow of potential spills and surface runoff could also be estimated based on site topography and indicated on the plant site drawings. Dry chemicals which are toxic pollutants or hazardous substances should be evaluated if they have the potential to reach navigable waters in significant quantities via rainfall runoff, for example.

A hazardous substance and toxic chemical (materials) inventory should be developed as a part of the "Risk Identification and Assessment". The detail of the materials inventory should be proportionate to the quantity of toxic pollutants and hazardous substances on site and their potential for reaching the receiving waters. For example:

- (1) The plant has determined that materials stored in bulk quantities at a tank farm have a high potential for reaching the receiving waters in the event of structural failure or overfills. Therefore, the materials inventory for the tank farm should be detailed, and should provide the identity, quantities, and locations of each material.
- (2) The plant has determined that materials stored in small quantities at the research laboratory have a low potential for reaching the receiving waters. Therefore, the materials inventory for the laboratory could be minimally detailed, and may not include the identity, quantity, or location of each material but might include an estimate of the total quantity

of toxic and hazardous materials stored and would provide the location of the laboratory. The rationale for the "low risk" nature of the laboratory would be provided in this part of the BMP plan.

- (3) The plant has determined that materials used in a batch operation in the manufacturing process have a high potential for reaching the receiving water. The plant supplies a variety of products through the batch operation process to accommodate fluctuations in public demand. Consequently, the materials used for the batch process vary from week to week, oftentimes unexpectedly. Therefore, the materials inventory for the batch operation should be detailed but remain flexible. The inventory might include the identification of each material expected for use, and the maximum quantity of material that the batch process can handle. The materials inventory could be updated to include any material substitutions unanticipated at the time of the original inventory.

The examples above illustrate the flexibility of the materials inventory. A materials inventory should be part of the "Risk Identification and Assessment" of every BMP plan but the detail of the inventory will vary with the size and complexity of the plant, the quantities of toxic and hazardous chemicals on site and the potential for incidents reaching receiving waters as well as the detail needed for the materials inventory requires sound engineering judgment.

The materials inventory and other useful technical information should be made available to the BMP Committee but may require separate filing from the BMP plan documents to protect proprietary information or trade secrets. This data may include physical, chemical, toxicological and health information (e.g., technical bulletins or material safety data sheets) on the toxic pollutants and hazardous substances handled; the quantities involved in various operations or ancillary sources; and the prevention, containment, mitigation, and cleanup techniques that are used or would be used in the event of a discharge.

Materials planned for future use in the plant should be evaluated for their potential to be discharged in significant amounts to receiving waters. Where the potential is high, the same type of technical data described above should be obtained.

Elements of "Risk Identification and Assessment", listed below, should be considered in developing a BMP plan:

- Identification of areas of the plant subject to BMP requirements.
- Examination of identified areas for potential risks of BMP incidents reaching receiving waters.
- Identification of existing site-specific or pollutant-specific containment measures.
- Plant plot plans or drawings that clearly label the identified areas.
- Simplified flowsheet(s) of the major process operations.
- Estimation of the direction of flow of potential discharges toward navigable waters.

- Evaluation of the potential for materials planned for future use to be discharged to receiving waters in significant amounts.
- Materials inventory system tailored to the need of the particular facility.
- Physical, chemical, toxicological, and health information on the toxic and hazardous chemicals on-site.

3. Reporting of BMP Incidents

A BMP incident reporting system is used to keep records of incidents such as spills, leaks, runoff and other improper discharges for the purpose of minimizing recurrence, expediting mitigation or cleanup activities, and complying with legal requirements. Reporting procedures defined by the BMP Committee should include: notification of a discharge to appropriate plant personnel to initiate immediate action; formal written reports for review and evaluation by management of the BMP incident and revisions to the BMP plan; and notification as required by law to governmental and environmental agencies in the event that a spill or other reportable discharge reaches the surface waters.

The reporting system should designate the avenues of reporting and the responsible company and government officials to whom the incidents would be reported. A list of names, office telephone numbers, and residence telephone numbers of key employees in the order of responsibility should be utilized when necessary for immediate reporting of BMP incidents to plant management for implementation of emergency response plans.

A communications system should be designated and available for notification of an impending or actual BMP incident. Reliable communications with the person or persons directly responsible would expedite immediate action and countermeasures to prevent incidents or to contain and mitigate discharged chemicals. Such a communication system could include telephone or radio contact between transfer operation, and alarm systems that would signal the location of an incident. Provisions to maintain communication in the event of a power failure should be addressed.

Written reports on all BMP incidents should be submitted to the plant's BMP Committee and plant management for review. Written reports should include the date and time of the discharge, weather conditions, nature of the materials involved, duration, volume, cause, environmental problems, countermeasures taken, people and agencies notified, and recommended revisions, as appropriate, to the BMP plan, operating procedures and/or equipment to prevent recurrence.

Procedures and key data should be outlined for necessary reporting of BMP incidents to federal, state, and local regulatory authorities. In some circumstances, voluntary reporting to authorities such as municipal sewage treatment works, drinking water treatment plants, and fish and wildlife commissions may be desirable. The plant individuals responsible for notification should be listed. Pertinent telephone numbers should be listed for those individuals in the plant and those in the agencies to be notified. The phone numbers should be reviewed periodically for accuracy and might actually be used in the course of a "spill drill".

Elements of "Reporting of BMP Incidents", listed below, should be considered in developing a BMP plan:

- Maintenance of records of incidents through formal reports for internal review.
- Notification as required by law to governmental and environmental agencies should an incident occur.
- Procedures for notifying the appropriate plant personnel, and taking preventive or mitigating actions.
- Identification of responsible company and government officials.
- A list of names, office telephone extensions, and residence telephone numbers of key personnel.
- A communications system for reporting incidents in-plant (i.e., telephone, alarms, radio, etc.).

4. Materials Compatibility

Incompatibility of materials can cause equipment failure resulting from corrosion, fire or explosion. Equipment failure can be prevented by ensuring that the materials of construction for containers handling hazardous substances or toxic pollutants are compatible with the containers' contents and surrounding environment.

Materials compatibility encompasses three (3) aspects: Compatibility of the chemicals being handled with the materials of construction of the container, compatibility of different chemicals upon mixing in a container, and compatibility of the container with its environment.

The specific requirement of "Materials Compatibility" in the BMP plan should provide procedures to address these three (3) aspects in the design and operation of the equipment on site handling toxic and hazardous materials.

The BMP documentation on materials compatibility should recognize the engineering practices already used in the plant, and should summarize these existing practices with regard to corrosion and other aspects of material compatibility. Specific consideration should be given to procedures and practices delineating the mixing of chemicals and the prohibition of mixing of incompatible chemicals which might result in fire, explosion or unusual corrosion. Thorough cleaning of storage vessels and equipment before being used for another chemical should be standard practice to ensure that there is no residual of a chemical that is incompatible with the second, or later, chemical to be used. Coatings or cathodic protection should be considered for protecting a buried pipeline or storage tank from corrosion.

Where applicable, material testing procedures should be described. Proposed substitutions for currently used toxic or hazardous chemicals should be studied to determine whether the construction materials of the existing containers are compatible with the proposed new conditions. The procedures utilized by the plant or an outside contractor to perform the materials compatibility study should be documented. Materials compatibility aspects of waste disposal which are covered by the RCRA hazardous waste regulations should be referenced in the BMP plan.

Elements of "Materials Compatibility", listed below, should be considered in developing a BMP plan:

- Evaluation of process changes or revisions for materials compatibility.
- Incorporation of existing engineering practices for materials of construction, corrosion, and other aspects of materials compatibility.
- Evaluation of procedures for mixing of chemicals and of possible incompatibility with other chemicals present.
- Cleansing of vessels and transfer lines before they are used for another chemical.
- Use of proper coatings and cathodic protection on buried pipelines if required to prevent failure due to external corrosion.

5. Good Housekeeping

Good housekeeping is essentially the maintenance of a clean, orderly work environment and contributes to the overall facility pollution control effort. Periodic training of employees on housekeeping techniques for those plant areas where the potential exists for BMP incidents reduces the possibility of incidents caused by mishandling of chemicals or equipment.

Examples of good housekeeping include neat and orderly storage of bags, drums and piles of chemicals; prompt cleanup of spilled liquids to prevent significant run-off to navigable waters; sweeping, vacuuming or other cleanup of accumulations of dry chemicals as necessary to prevent

them from reaching receiving waters; and provisions for storage of containers or drums to keep them from protruding into open walkways or pathways.

Maintaining employee interest in good housekeeping is a vital part of the BMP plan. Methods for maintaining good housekeeping goals could include regular housekeeping inspections by supervisors and higher management; discussions of housekeeping at meetings; and publicity through posters, suggestion boxes, bulletin boards, slogans, incentive programs and employee publications.

Elements of "Good Housekeeping", listed below, should be considered in developing a BMP plan:

- Neat and orderly storage of chemicals.
- Prompt removal of spillage.
- Maintenance of dry and clean floors by use of brooms, vacuum cleaners, etc.
- Proper pathways and walkways and no containers and drums that protrude onto walkways.
- Minimum accumulation of liquid and solid chemicals on the ground or floor.
- Stimulation of employee interest in good housekeeping.

6. Preventive Maintenance

An effective preventive maintenance (PM) program is important to prevent BMP incidents. A PM program involves inspection and testing of plant equipment and systems to uncover conditions which could cause breakdowns or failures with resultant significant discharges of chemicals to receiving waters. The program should prevent breakdowns

and failures by adjustment, repair or replacement of items. A PM program should include a suitable records system for scheduling tests and inspections, recording test results, and facilitating corrective action. Most plants have existing PM programs which provide a degree of environmental protection. It is not the intent of the BMP plan to require development of a redundant PM program. Instead, the objective is to have qualified plant personnel (e.g., BMP Committee, maintenance foreman, environmental engineer) evaluate the existing plant PM program and recommend to management those changes, if any, needed to address BMP requirements.

A good PM program should include the following: (1) identification of equipment or systems to which the PM program should apply (2) periodic inspections or tests of identified equipment and systems; (3) appropriate adjustment, repair, or replacement of items; and (4) maintenance of complete PM records on the applicable equipment and systems.

The BMP plan documentation of PM may include a list of procedures, examples of record keeping, a list of the principal systems to which the PM program is applicable, and directions for obtaining the records for any particular system included or referenced in the BMP plan. In general, it will be adequate to reference in the BMP plan the scope and location of existing PM procedures and records applicable to the PM specific requirement.

Elements of "Preventive Maintenance", listed below, should be considered in developing a BMP plan:

- Identification of equipment and systems to which the PM program should apply.

- Periodic inspections of identified equipment and systems.
- Periodic testing of such equipment and systems.
- Appropriate adjustment, repair, or replacement of parts.
- Maintenance of complete PM records on the applicable equipment and systems.

7. Inspections and Records

The purpose of the inspection and records system is to detect actual or potential BMP incidents. The BMP plan should include written inspection procedures and optimum time intervals between inspections. Records to show the completion date and results of each inspection should be signed by the appropriate supervisor and maintained for a period of three (3) years. A tracking (follow-up) procedure should be instituted to assure that adequate response and corrective action have been taken. The record keeping portion of this system can be combined with the existing spill reporting system in the plant.

While plant security and other personnel may frequently and routinely inspect the plant for BMP incidents, these people are not necessarily capable of assessing the potential for such incidents. Thus certain inspections should be assigned to designated qualified individuals, such as maintenance personnel or environmental engineering staff.

The inspection and records system should include those equipment and plant areas identified in the "Risk Identification and Assessment" portion of the BMP plan as having the potential for significant discharges. To determine the inspection frequency and inspection procedures, competent environmental personnel should evaluate the causes

of previous incidents, and assess the probable risks for incident occurrence. Furthermore, the nature of chemicals handled, materials of construction, and site-specific factors including age, inspection techniques and cost effectiveness should be considered.

Qualified plant personnel should be identified to inspect designated equipment and plant areas. Typical inspections should include examination of pipes, pumps, tanks, supports, foundations, dikes, and drainage ditches. Records should be kept to determine if changes in preventive maintenance or good housekeeping procedures are necessary. Each of the ancillary sources should have "Inspection and Records" programs designed to meet the needs of the particular facility.

Material storage areas for dry chemicals should be inspected for evidence of, or the potential for, windblowing which might result in significant discharges. Liquid storage areas should be inspected for leaks in tanks, for corrosion of tanks, for deterioration of foundations or supports, and for closure of drain valves in containment facilities. Inspections could include the examination of seams, rivets, nozzle connections, valves, and connecting pipelines. Storage tanks should be inspected for evidence of corrosion, pitting, cracks, abnormalities, and deformation and such evidence should then be evaluated.

For in-plant transfer and materials handling of liquids, inspections should include visual examination for evidence of deterioration of pipelines, pumps, valves, seals and fittings. The general condition of items such as flange and expansion joints, pipeline supports, locking valves, catch or drip pans, and metal surfaces also should be assessed.

For loading and unloading operations, inspections during transfer of materials would permit immediate response if an incident occurred. The conditions of pipelines, pumps, valves, and fittings for liquid transfer systems and pneumatic conveying systems used for transferring dry chemicals should be inspected. Inspections (together with monitoring) should be used to ensure that the transfer of material is complete before flexible or fixed transfer lines are disconnected prior to vehicular departure. Before any tank car or tank truck is filled, the lower-most drain valve and all outlets of such vehicles should be closely examined for evidence of leakage and, if necessary, tightened, adjusted, or replaced. Before departure, all tank cars or tank trucks should be closely examined to ensure that all transfer lines are disconnected and that there is no evidence of leakage from any outlet.

For plant runoff, inspections should be used for examining the integrity of the storm water collection system and the diversion or overflow structures, and for ensuring the drain valves and pumps for diked areas are properly closed. The plant sewer and storm sewer system should be periodically surveyed to ensure that toxic and hazardous pollutants are not discharged in significant amounts. Inspections also should include diked areas to ensure that hazardous and toxic chemicals are not discharged from inside diked areas to waterways. Any liquid, including rainwater, should be examined, and where necessary, analyzed, before being released from the diked areas to a receiving water.

For sludge and hazardous waste disposal sites, visual inspections should include examinations for leaks, seepage, and overflows from land disposal sites such as pits, ponds, lagoons, and landfill. Other procedures and inspection techniques should be considered on a site-

specific basis. Any inspections made or records kept to comply with RCRA may be included in the BMP plan by reference.

Elements of "Inspection and Records", listed below, should be considered in developing a BMP plan:

- Inspection of:
 - storage facilities,
 - transfer pipelines,
 - loading and unloading areas,
 - pipes, pumps, valves, and fittings,
 - tank corrosion (internal and external),
 - windblowing of dry chemicals,
 - tank support or foundation deterioration,
 - seams along drainage ditches and old tanks,
 - deterioration of primary or secondary containment,
 - housekeeping,
 - drain valves on tanks,
 - damage to shipping containers,
 - conveying systems for dry chemicals,
 - integrity of storm water collection system,
 - leaks, seepage, and overflows from sludge and waste disposal sites.
- Records of all inspections
- Tracking procedures to assure adequate response and corrective actions have been taken when inspections reveal deficiencies.

8. Security

A security system is needed to prevent accidental or intentional entry to a plant which might result in vandalism, theft, sabotage or other improper or illegal use of plant facilities that could possibly cause a BMP incident. Most plants have security systems to prevent unauthorized entry leading to theft, vandalism, sabotage and the like. The BMP plan should describe those portions of the existing security system which ensure that the pertinent chemicals are not discharged to receiving waters in significant quantities. Documentation of the security system may require separate filing from the BMP plan documents to prevent unauthorized individuals from gaining access to confidential information.

The BMP Committee, plant security manager, plant engineer or other qualified plant personnel should evaluate the coverage of the existing security system for those areas of the plant and the equipment identified by the "Risk Identification and Assessment" specific requirement as having the potential for significant discharges. They should recommend to plant management any changes necessary to improve the security system.

Examples of security measures include: routine patrol of the plant by security guards in vehicles or on foot; fencing to prevent intruders from entering the plant site; good lighting; vehicular traffic control; a guardhouse or main entrance gate, where all visitors are required to sign in and obtain a visitor's pass; secure or locked entrances to the plant; locks on certain valves or pump starters; and television surveillance of appropriate plant sites, such as plant entrance, and loading and unloading areas.

Whenever possible, security personnel should be instructed to observe leaks from tanks, valves, or pipelines while patrolling the plant and also be informed of the procedures to follow when a spill or other discharge is detected. Many plants use contractor or plant security personnel who may not be qualified or may not have time to carry out such surveillance. In such cases, the surveillance can be incorporated in the "Inspection and Records" specific requirement and should be conducted by production or environmental staff.

Elements of "Security", listed below, should be considered in developing a BMP plan:

- Routine patrols of plant by security personnel.
- Fencing.
- Good lighting.
- Vehicular traffic control.
- Controlled access at guardhouse or main entrance gate.
- Visitor passes.
- Locked entrances.
- Locks on certain drain valves and pump starters.
- Television monitoring.

9. Employee Training

Employee training programs should instill in personnel, at all levels or responsibility, a complete understanding of the BMP plan, the processes and materials with which they are working, the safety hazards,

the practices for preventing discharges, and the procedures for responding properly and rapidly to toxic and hazardous materials incidents. Employee training meetings should be conducted at least annually to assure adequate understanding of the objectives of the BMP plan and the individual responsibilities of each employee. Typically, these meetings could be a part of routine employee meetings for safety or fire protection. Such meetings should highlight previous spill events or failures, malfunctioning equipment components, and recently developed BMP precautionary measures. Training sessions should review the BMP plan and associated procedures. Just as fire drills are used to improve an employee's reaction to a fire emergency, spill or environmental incident drills may serve to improve the employee's reactions to BMP incidents. Plants are encouraged to conduct spill drills on a quarterly or semi-annual basis. Spill drills serve to evaluate the employees' knowledge of BMP-related procedures and are a fundamental part of employee training.

Of particular importance is the strong commitment and periodic input from top management to the employee training program to create the necessary climate of concern for a successful program. A plant manager might accomplish more in a brief, face-to-face appearance than an elaborate, impersonal training program would accomplish.

Adequate training in a particular job and process operation is essential for understanding potential discharge problems. Knowledge of specific manufacturing operations and how discharges could occur, or have occurred in the past, is important in reducing human error that can lead to BMP incidents.

The training program also should be aimed at making employees aware of the protocol used to report discharges and notifying the people responsible for response so that immediate countermeasures can be initiated. In addition, personnel involved in BMP-incident response would be trained to use cleanup materials such as sorbents, gelling agents, foams, and neutralizing agents. As appropriate, they should be educated in safety precautions, in the side effects of the chemicals they are working with, and in possible chemical reactions. Operating manuals and standard procedures for process operations should include appropriate sections on the BMP plan and the spill control program and would be readily available for reference. Spill response drills, suggestion boxes, posters, and incentive programs can be used to motivate employees to be alert to the potential for discharges and to their prevention.

The employee training program should include records of the frequency, and names and position of the employees trained as well as the lesson plans, subject material covered, and instructors' names and positions. BMP-related training may be combined with other forms of training, such as safety and fire prevention at the discretion of the plant.

In addition to permanent personnel, contractors or temporary personnel should be trained in procedures for preventing BMP incidents since these individuals may be unfamiliar with the normal operating procedures or location of equipment (pipelines, tanks, etc.) at the facility. Adequate supervision of contractor maintenance personnel should be provided to minimize the possibility of BMP incidents resulting from damaging equipment such as buried pipelines.

Elements of "Employee Training", listed below, should be considered in developing the BMP plan:

- Meetings held at least annually to assure adequate understanding of program goals and objectives.
- Environmental Incident (Spill) drills used at least semiannually.
- Periodic input from management.
- Adequate training in particular job and process operation and the effect on other operations.
- Transmission of knowledge of past incidents and causes.
- Making employees aware of BMP plan and incident reporting procedures.
- Training in the use of sorbents, gelling agents, foams, and neutralizing agents for cleanup or mitigation of incidents.
- Operating manuals and standard procedures.
- Making employees aware of health risks of chemicals handled through both the plant's BMP plan and safety program.
- Motivating employees concerning incident prevention and control.
- Records of the personnel who were trained, and of the dated, instructors, subject matter, and lesson plans of the training sessions.
- Training and supervision of contractors and temporary personnel.